

WHAT IS CLAIMED IS:

1. A method of conducting bi-directional communication with a model vehicle, the method comprising:

transmitting a command inquiry signal to the model vehicle from a control unit during a first communication period;

automatically pausing transmission by the control unit during the entirety of a second communication period immediately following the first communication period;

causing the model vehicle to transmit a response signal during the second communication period; and

automatically resuming transmission by the control unit at the conclusion of the second communication period.

1 2. The method of claim 1 wherein the command inquiry signal and the
2 response signal are transmitted utilizing a bi-directional communication protocol adapted
3 from an existing uni-directional communication protocol.

3. The method of claim 2 wherein legacy model vehicles configured to interpret only the existing uni-directional communication protocol interpret the command inquiry as a communication error.

1 4. The method of claim 2 wherein where the control unit automatically
2 transmits a no operation signal for two consecutive communication periods following the
3 second communication period if the base station fails to receive the response signal.

1 5. The method of claim 2 wherein the bi-directional communication
2 protocol is adapted by varying a state of an error detection code of the uni-directional
3 communication protocol.

1 6. The method of claim 5 wherein the error detection code comprises a
2 four bits of a twenty-three bit signal packet.

1 7. The method of claim 2 wherein the bi-directional communication
2 protocol is adapted by varying a state of a space-filling code of the uni-directional
3 communication protocol.

1 8. The method of claim 7 wherein the space filling code comprises at
2 least one of three trailing bits of a twenty-three bit signal packet.

1 9. The method of claim 1 wherein the command inquiry signal
2 includes address information specific to particular model vehicle, and the response signal
3 also includes the address information.

1 10. The method of claim 1 wherein the response signal includes
2 information relating to at least one of the location, speed, direction of movement, identity,
3 and health of the model vehicle.

1 11. The method of claim 1 further comprising receiving the command
2 inquiry signal on an antenna of a model train locomotive.

1 12. A system for interrogating a model vehicle, the system comprising:
2 a control unit including,
3 a first receiver;
4 a first transmitter in electrical communication with a model vehicle,
5 the first transmitter configured to transmit a command inquiry signal during
6 a first communication period, and configured to automatically pause
7 transmission for an entirety of a second communication period immediately
8 following the first communication period; and
9 a model vehicle including,
10 an antenna in electrical communication with the control unit and
11 configured to receive the command inquiry signal therefrom;
12 a second receiver in configured to receive the command inquiry
13 signal from the antenna; and
14 a second transmitter configured to transmit a response signal to the
15 antenna during the second communication period in reply to the command
16 inquiry signal, wherein the control unit is configured to recognize the
17 response signal.

1 13. The system of claim 12 wherein:
2 the control unit further comprises a first element configured in a first state
3 to place the first transmitter in electrical communication with the track to transmit the

4 command inquiry signal, and configured in a second state to place the first receiver in
5 electrical communication with the track to receive the response signal; and
6 the model vehicle further comprises a second element configured in a first
7 state to place the second receiver in electrical communication with the antenna to receive
8 the command inquiry signal, and configured in a second state to place the second
9 transmitter in electrical communication with the antenna to transmit the response signal.

1 14. The system of claim 13 wherein the at least one of the first and
2 second elements comprises an active switch controlled by a processor.

1 15. The system of claim 12 wherein the first receiver and the first
2 transmitter are in wired communication with a model railroad track, and the antenna is
3 positioned on a model railroad locomotive.

1 16. The system of claim 12 further comprising a stationary track
2 element including,
3 a second antenna in wireless communication with the track;
4 a third receiver in configured to receive the command inquiry signal from
5 the second antenna; and
6 a third transmitter configured to transmit a third signal to the second
7 antenna in response to the command inquiry signal, wherein at least one of the base
8 unit and the model vehicle are configured to receive and recognize the third signal
9 as returned by the stationary track element.

1 17. The system of claim 12 wherein the model vehicle comprises a
2 remote-control vehicle, the first receiver and the first transmitter are in wireless
3 communication with the model vehicle, and the antenna is positioned within the model
4 vehicle.

1 18. A bidirectional communications protocol for communication with a
2 model vehicle, the communications protocol comprising:
3 a first command set belonging to a legacy uni-directional communication
4 protocol; and
5 a second command set extended from the first command set and comprising
6 a command inquiry signal for transmission by a control element in communication with a

7 model vehicle, and a response signal for transmission by the model vehicle in reply to the
8 command inquiry signal.

1 19. The communication protocol of claim 18 wherein the command
2 inquiry signal and the response signal comprise a twenty-three bit signal packet.

1 20. The communication protocol of claim 19 wherein second command
2 set includes error detection information recognizable to indicate the second command set..

1 21. The communication protocol of claim 19 wherein the second
2 command set includes space-filling information recognizable to indicate the second
3 command set.